

REMARKS

Claims 1-5, 7-18, 43-45, 47-64 are pending in the present application. Claims 6 and 46 have been canceled. Claims 1 and 43 have been amended. Reconsideration of this application in view of the above amendments and the following remarks is respectfully requested.

In paragraphs 1-4 of the Office Action, all pending claims were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,703,276 to Beer ("Beer") in view of additional prior art. In particular, claims 1-14 and 16-17 were alleged to be obvious over Beer in view U.S. Patent No. 4,931,760 to Yamaguchi et al. ("Yamaguchi"); claims 15, 43-49 and 62 were alleged to be unpatentable over Beer in view of Yamaguchi and further in view of U.S. Patent No. 5,148,138 to Miyata ("Miyata"); and claims 18, 50-61 and 63-64 were alleged to be unpatentable over Beer in view of Yamaguchi and further in view of U.S. Patent No. 4,727,327 to Toyoshima et al. ("Toyoshima"). Applicants respectfully traverse.

In particular, originally filed claim 1 recites adjacent magnets of the magnet assembly being "separated by gaps, thereby permitting magnetic flux between adjacent magnets to substantially extend into the surrounded volume." The Office Action considered this limitation to be inherent, asserting that the prior art discloses "the magnets being separated from each other and would inherently have a non-homogeneous, or heterogeneous, magnetic field produced in the gap therebetween." (Office Action, pg. 3). Applicants respectfully disagree because while the drawings in Beer show gaps between adjacent magnets, the written description of the Beer patent discloses a design in which the magnetic field remains substantially uniform in the entire enclosed volume, thus teaching away from the claimed subject matter:

The segments are configured so that spaces exist between adjacent segments as indicated in Fig. 1. Using the analysis contained in Reference [1], the size of segments 16 and the spacing therebetween are selected such that the fundamental spatial frequency associated with the eight segments in a ring is substantially removed and the magnetic field within aperture 17 of a given field due only to the segments of the field is substantially uniform. (col. 4, ll. 41-49 of Beer).

Clearly, the claimed feature is not inherent in the design of Beer. Indeed, contrary to the assertion in the Office Action, there is no disclosure, teaching or suggestion in either Beer or Yamaguchi of a magnet assembly expressly permitting magnetic flux between adjacent magnets to extend **substantially** into the surrounded volume, thus creating a nonhomogeneous magnetic field in the enclosed volume. (See Beer at col. 2, ll. 40-50, Abstract; Yamaguchi at Abstract, stating that magnetic field generators in MRI instruments “need an extremely uniform and wide magnetic field space;” col. 2, ll. 24-34, 49-58). In fact, one object of Yamaguchi is “to offer a magnetic field generator with means of field regulation which can sufficiently reduce not only low dimensional harmonics but also high-dimensional harmonics, and which are so arranged as to permit easy regulation in short time” (Summary of the Invention, col. 3, ll. 42-47), which is similarly inconsistent with the assertion that claimed feature is inherent.

In short, as discussed in the Background section of this application, the prior art (including Beer and Yamaguchi) considers field distortions in the entire enclosed zone of the magnet assembly undesirable and to be avoided, particularly in the context of magnetic resonance imaging (MRI), which generally involves highly accurate measurements. By contrast, this application discloses a magnet assembly for use in NMR measurements, where receiving signal from only a portion of the enclosed volume using part-uniform, part-nonuniform interior magnetic field can be advantageous.

For the above reasons, applicants submit that rejected claim 1 as previously amended is patentable over the prior art. However, in the interest of expediting the prosecution of the present application and to avoid any confusion as to the creation of two separate magnetic

fields in the enclosed volume of the assembly, applicants have amended claim 1 to include the limitations of original claim 6, which has been canceled. Amended claim 1 thus recites “the placement and magnetic properties of the magnets being selected to produce: a first magnetic field, substantially homogeneous, within an inner portion of the surrounded volume; and a second magnetic field, substantially different from the first magnetic field, in the remainder of the surrounded volume.” Amended claim 1 and the claims that depend thereon are believed patentable over the art of record because, as noted above, Beer teaches away from a magnet assembly designed to generate homogeneous and non-homogeneous magnetic field, respectively in different volumes of the enclosed volume.

Independent claim 43 was amended similarly to incorporate the limitations of claim 46, which was canceled. As amended, claim 43 and the claims dependent thereon are believed patentable for substantially the same reasons as set forth above in connection with claim 1.

Applicants respectfully traverse the rejection of independent claim 50 (and the claims dependent thereon) in paragraph 4 of the Office Action over the Beer, Yamaguchi and Toyoshima references.

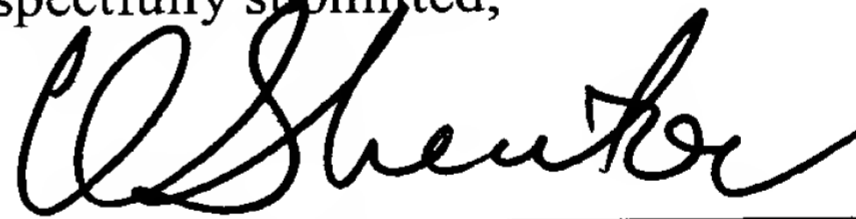
Claim 50 recites four or more magnets “being disposed so that their magnetization directions have substantially the same orientation, and adjacent magnets of the assembly being separated by gaps.” By contrast, the references of record disclose magnet segments where only diagonally opposite segments have the same magnetization direction but, for example, adjacent segments do not. (See, for example, corresponding Figures 1 in Beer and Yamaguchi, and Fig. 4 in Toyashima. This is an important design difference, which is simply not disclosed in the prior art of record, nor would it be obvious over it. Accordingly, applicants submit that claim 50 and the claims dependent thereon are patentable.

Furthermore, while the Office Action asserted that Toyoshima discloses a high-permeability ring surrounding the magnets (identified by reference numeral 37 in Toyoshima), applicants respectfully disagree. The ring structure 37 surrounding the magnets in the Toyoshima reference is merely a part of the support frame. (Toyoshima at col. 5, ll. 15-18, col. 6, ll. 1-7 and ll. 16-24). This support frame is neither same as nor equivalent in function or material composition to the high-permeability ring recited in claim 50. The support frame 37 in the Toyoshima reference is a well know structure which holds the magnetic blocks in place. It is usually made of a strong, non-magnetic material suitable for supporting heavy magnet assembly and preventing emanation of the magnetic field outside the assembly. In contrast, claim 50 recites a ring disposed around the magnets being made of highly permeable material to provide a path for magnetic field lines of the magnets. (See, e.g., Fig. 7 and 8; col. p. 11, ll. 18-24 of the application). Accordingly, claim 50 and its dependent claims are patentable over the art of record.

Based on the foregoing, applicants respectfully request that all pending claims of this application be allowed.

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Respectfully submitted,



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